

US Patents Co-assigned by SanDisk & Toshiba

| # | Pat. # | Patent Title | Filed |
|----|---------------------------|---|------------|
| 1 | 9,543,516 | Method for forming a doped metal oxide for use in resistive switching memory elements | 6/27/2014 |
| 2 | 9,508,422 | Non-volatile semiconductor memory adapted to store a multi-valued data in a single memory cell | 12/30/2015 |
| 3 | 9,425,394 | Doped oxide dielectrics for resistive random access memory cells | 12/10/2014 |
| 4 | 9,343,673 | Method for forming metal oxides and silicides in a memory device | 1/16/2015 |
| 5 | 9,299,928 | Nonvolatile memory device having a current limiting element | 2/19/2015 |
| 6 | 9,299,926 | Nonvolatile memory device using a tunnel oxide layer and oxygen blocking layer as a current limiter element | 2/17/2012 |
| 7 | 9,276,210 | Conductive barriers for ternary nitride thin-film resistors | 12/04/2014 |
| 8 | 9,276,203 | Resistive switching layers including Hf-Al-O | 12/20/2012 |
| 9 | 9,275,727 | Multi-level memory array having resistive elements for multi-bit data storage | 2/20/2015 |
| 10 | 9,269,902 | Embedded resistors for resistive random access memory cells | 12/26/2013 |
| 11 | 9,269,896 | Confined defect profiling within resistive random memory access cells | 10/21/2014 |
| 12 | 9,257,189 | Non-volatile semiconductor memory adapted to store a multi-valued data in a single memory cell | 12/03/2014 |
| 13 | 9,246,096 | Atomic layer deposition of metal oxides for memory applications | 2/17/2015 |
| 14 | 9,246,091 | ReRAM cells with diffusion-resistant metal silicon oxide layers | 7/23/2014 |
| 15 | 9,246,085 | Shaping ReRAM conductive filaments by controlling grain-boundary density | 7/23/2014 |
| 16 | 9,224,951 | Current-limiting electrodes | 7/21/2014 |
| 17 | 9,184,383 | Nonvolatile memory device having an electrode interface coupling region | 1/16/2014 |
| 18 | 9,184,379 | Capping thin-film resistors to control interface oxidation | 7/18/2014 |
| 19 | 9,178,151 | Work function tailoring for nonvolatile memory applications | 11/13/2013 |
| 20 | 9,178,148 | Resistive random access memory cell having three or more resistive states | 3/03/2015 |
| 21 | 9,178,140 | Morphology control of ultra-thin MeOx layer | 2/17/2015 |
| 22 | 9,178,000 | Resistive random access memory cells having shared electrodes with transistor devices | 4/29/2014 |
| 23 | 9,130,165 | Atomic layer deposition of metal oxide materials for memory applications | 10/03/2014 |
| 24 | 9,117,516 | Resistance change memory | 9/05/2013 |
| 25 | 9,087,978 | Transition metal oxide bilayers | 2/10/2015 |
| 26 | 9,065,040 | Controlling composition of multiple oxides in resistive switching layers using atomic layer deposition | 10/09/2014 |
| 27 | 9,054,307 | Resistive random access memory cells having metal alloy current limiting layers | 7/27/2014 |
| 28 | 9,048,425 | Bipolar multistate nonvolatile memory | 10/20/2014 |
| 29 | 9,047,940 | Resistive random access memory cells having variable switching characteristics | 1/10/2013 |
| 30 | 9,040,413 | Using saturated and unsaturated ALD processes to deposit oxides as ReRAM switching layer | 12/13/2012 |
| 31 | 9,012,879 | Morphology control of ultra-thin MeOx layer | 9/22/2014 |
| 32 | 9,006,696 | Metal aluminum nitride embedded resistors for resistive random memory access cells | 9/08/2014 |
| 33 | 9,006,026 | Atomic layer deposition of metal oxides for memory applications | 8/22/2014 |
| 34 | 9,001,554 | Resistive random access memory cell having three or more resistive states | 1/10/2013 |
| 35 | 9,000,407 | ReRAM materials stack for low-operating-power and high-density applications | 5/28/2013 |
| 36 | 8,995,172 | Nonvolatile memory device having a current limiting element | 2/21/2014 |
| 37 | 8,995,166 | Multi-level memory array having resistive elements for multi-bit data storage | 12/20/2012 |
| 38 | 8,987,865 | Memory device having an integrated two-terminal current limiting resistor | 5/27/2014 |
| 39 | 8,987,697 | Transition metal oxide bilayers | 4/14/2014 |
| 40 | 8,981,329 | Method of forming anneal-resistant embedded resistor for non-volatile memory application | 11/20/2014 |
| 41 | 8,980,766 | Sequential atomic layer deposition of electrodes and resistive switching components | 7/10/2014 |

| | | | |
|----|---------------------------|--|------------|
| 42 | 8,975,727 | Memory cell having an integrated two-terminal current limiting resistor | 12/20/2012 |
| 43 | 8,975,114 | Method for forming metal oxides and silicides in a memory device | 3/14/2013 |
| 44 | 8,929,135 | Non-volatile semiconductor memory device adapted to store a multi-valued data in a single memory cell | 11/12/2013 |
| 45 | 8,921,154 | Method of forming anneal-resistant embedded resistor for non-volatile memory application | 8/26/2014 |
| 46 | 8,913,418 | Confined defect profiling within resistive random memory access cells | 5/10/2013 |
| 47 | 8,912,524 | Defect gradient to boost nonvolatile memory performance | 11/08/2013 |
| 48 | 8,906,736 | Multifunctional electrode | 9/08/2014 |
| 49 | 8,901,530 | Nonvolatile memory device using a tunnel oxide as a passive current steering element | 2/19/2014 |
| 50 | 8,895,949 | Nonvolatile memory device using a varistor as a current limiter element | 2/10/2014 |
| 51 | 8,890,109 | Resistive random access memory access cells having thermally isolating structures | 12/20/2012 |
| 52 | 8,889,492 | Bipolar multistate nonvolatile memory | 4/23/2014 |
| 53 | 8,883,655 | Atomic layer deposition of metal oxide materials for memory applications | 5/17/2013 |
| 54 | 8,883,557 | Controlling composition of multiple oxides in resistive switching layers using atomic layer deposition | 9/03/2013 |
| 55 | 8,878,152 | Nonvolatile resistive memory element with an integrated oxygen isolation structure | 2/29/2012 |
| 56 | 8,872,152 | IL-free MIM stack for clean RRAM devices | 12/13/2012 |
| 57 | 8,866,121 | Current-limiting layer and a current-reducing layer in a memory device | 2/17/2012 |
| 58 | 8,866,118 | Morphology control of ultra-thin MeOx layer | 12/21/2012 |
| 59 | 8,860,002 | Limited maximum fields of electrode-switching layer interfaces in Re-RAM cells | 12/20/2012 |
| 60 | 8,859,328 | Multifunctional electrode | 4/16/2014 |
| 61 | 8,853,661 | Metal aluminum nitride embedded resistors for resistive random memory access cells | 3/15/2013 |
| 62 | 8,853,099 | Nonvolatile resistive memory element with a metal nitride containing switching layer | 12/16/2011 |
| 63 | 8,852,996 | Carbon doped resistive switching layers | 12/20/2012 |
| 64 | 8,847,187 | Method of forming anneal-resistant embedded resistor for non-volatile memory application | 12/03/2012 |
| 65 | 8,846,484 | ReRAM stacks preparation by using single ALD or PVD chamber | 2/15/2012 |
| 66 | 8,846,443 | Atomic layer deposition of metal oxides for memory applications | 4/05/2011 |
| 67 | 8,817,524 | Resistive random access memory cells having metal alloy current limiting layers | 12/20/2012 |
| 68 | 8,809,205 | Sequential atomic layer deposition of electrodes and resistive switching components | 12/20/2012 |
| 69 | 8,809,159 | Radiation enhanced resistive switching layers | 12/20/2012 |
| 70 | 8,802,492 | Method for forming resistive switching memory elements | 8/29/2011 |
| 71 | 8,796,103 | Forming nonvolatile memory elements by diffusing oxygen into electrodes | 12/20/2012 |
| 72 | 8,787,066 | Method for forming resistive switching memory elements with improved switching behavior | 10/26/2011 |
| 73 | 8,779,407 | Multifunctional electrode | 2/07/2012 |
| 74 | 8,748,237 | Memory device having an integrated two-terminal current limiting resistor | 10/28/2013 |
| 75 | 8,742,392 | Bipolar multistate nonvolatile memory | 7/29/2013 |
| 76 | 8,741,772 | In-situ nitride initiation layer for RRAM metal oxide switching material | 2/16/2012 |
| 77 | 8,741,698 | Atomic layer deposition of zirconium oxide for forming resistive-switching materials | 11/29/2011 |
| 78 | 8,735,864 | Nonvolatile memory device using a tunnel nitride as a current limiter element | 8/20/2013 |
| 79 | 8,735,217 | Multifunctional electrode | 9/04/2013 |
| 80 | 8,704,203 | Transition metal oxide bilayers | 8/20/2013 |
| 81 | 8,698,119 | Nonvolatile memory device using a tunnel oxide as a current limiter element | 1/19/2012 |
| 82 | 8,686,386 | Nonvolatile memory device using a varistor as a current limiter element | 2/17/2012 |
| 83 | 8,681,530 | Nonvolatile memory device having a current limiting element | 1/18/2012 |
| 84 | 8,659,001 | Defect gradient to boost nonvolatile memory performance | 9/01/2011 |
| 85 | 8,658,997 | Bipolar multistate nonvolatile memory | 2/14/2012 |
| 86 | 8,652,923 | Nonvolatile memory device having an electrode interface coupling region | 3/14/2013 |

| | | | |
|-----|---------------------------|--|------------|
| 87 | 8,637,413 | Nonvolatile resistive memory element with a passivated switching layer | 12/02/2011 |
| 88 | 8,618,525 | Work function tailoring for nonvolatile memory applications | 6/09/2011 |
| 89 | 8,605,511 | Non-volatile semiconductor memory device adapted to store a multi-valued data in a single memory cell | 3/29/2012 |
| 90 | 8,598,682 | Memory device having an integrated two-terminal current limiting resistor | 11/13/2012 |
| 91 | 8,569,104 | Transition metal oxide bilayers | 2/07/2012 |
| 92 | 8,563,366 | Memory device having an integrated two-terminal current limiting resistor | 2/28/2012 |
| 93 | 8,552,413 | Nonvolatile memory device using a tunnel nitride as a current limiter element | 2/07/2012 |
| 94 | 8,546,275 | Atomic layer deposition of hafnium and zirconium oxides for memory applications | 9/19/2011 |
| 95 | 8,208,311 | Non-volatile semiconductor memory device adapted to store a multi-valued data in a single memory cell | 12/14/2010 |
| 96 | 8,111,551 | Nonvolatile semiconductor memory device having protection function for each memory block | 5/02/2011 |
| 97 | 7,952,925 | Nonvolatile semiconductor memory device having protection function for each memory block | 7/29/2010 |
| 98 | 7,787,296 | Nonvolatile semiconductor memory device having protection function for each memory block | 4/23/2008 |
| 99 | 7,394,704 | Non-volatile semiconductor memory device, electronic card using the same and electronic apparatus | 11/30/2005 |
| 100 | 7,394,692 | Non-volatile semiconductor memory with large erase blocks storing cycle counts | 5/22/2006 |
| 101 | 7,376,010 | Nonvolatile semiconductor memory device having protection function for each memory block | 3/24/2006 |
| 102 | 7,286,404 | Non-volatile semiconductor memory adapted to store a multi-valued data in a single memory cell | 5/04/2006 |
| 103 | 7,224,613 | Operating techniques for reducing effects of coupling between storage elements of a non-volatile memory operated in multiple data states | 8/16/2005 |
| 104 | 7,088,616 | Nonvolatile semiconductor memory adapted to store a multi-valued data in a single memory cell | 2/03/2005 |
| 105 | 7,085,161 | Non-volatile semiconductor memory with large erase blocks storing cycle counts | 12/02/2004 |
| 106 | 7,061,798 | Operating techniques for reducing effects of coupling between storage elements of a non-volatile memory operated in multiple data states | 10/15/2004 |
| 107 | 7,046,555 | Methods for identifying non-volatile memory elements with poor subthreshold slope or weak transconductance | 9/17/2003 |
| 108 | D517,072 | IC memory card | 10/15/2002 |
| 109 | 6,990,019 | Nonvolatile semiconductor memory adapted to store a multi-valued data in a single memory cell | 9/08/2003 |
| 110 | 6,990,018 | Non-volatile semiconductor memory device, electronic card using the same and electronic apparatus | 4/14/2004 |
| 111 | D510,935 | IC memory card | 6/24/2004 |
| 112 | D510,579 | IC memory card | 6/24/2004 |
| 113 | 6,944,063 | Non-volatile semiconductor memory with large erase blocks storing cycle counts | 1/28/2003 |
| 114 | D507,795 | IC memory card | 6/24/2004 |
| 115 | D505,959 | IC memory card | 10/15/2002 |
| 116 | 6,807,095 | Multi-state nonvolatile memory capable of reducing effects of coupling between storage elements | 12/18/2002 |
| 117 | 6,643,188 | Non-volatile semiconductor memory device adapted to store a multi-valued data in a single memory cell | 1/22/2002 |
| 118 | D467,586 | IC memory card | 9/17/2001 |
| 119 | D460,456 | IC memory card | 9/17/2001 |
| 120 | D459,355 | IC memory card | 9/17/2001 |
| 121 | D446,525 | IC memory card | 2/23/2000 |
| 122 | D445,111 | IC memory card | 2/23/2000 |
| 123 | D444,473 | IC memory card | 2/23/2000 |